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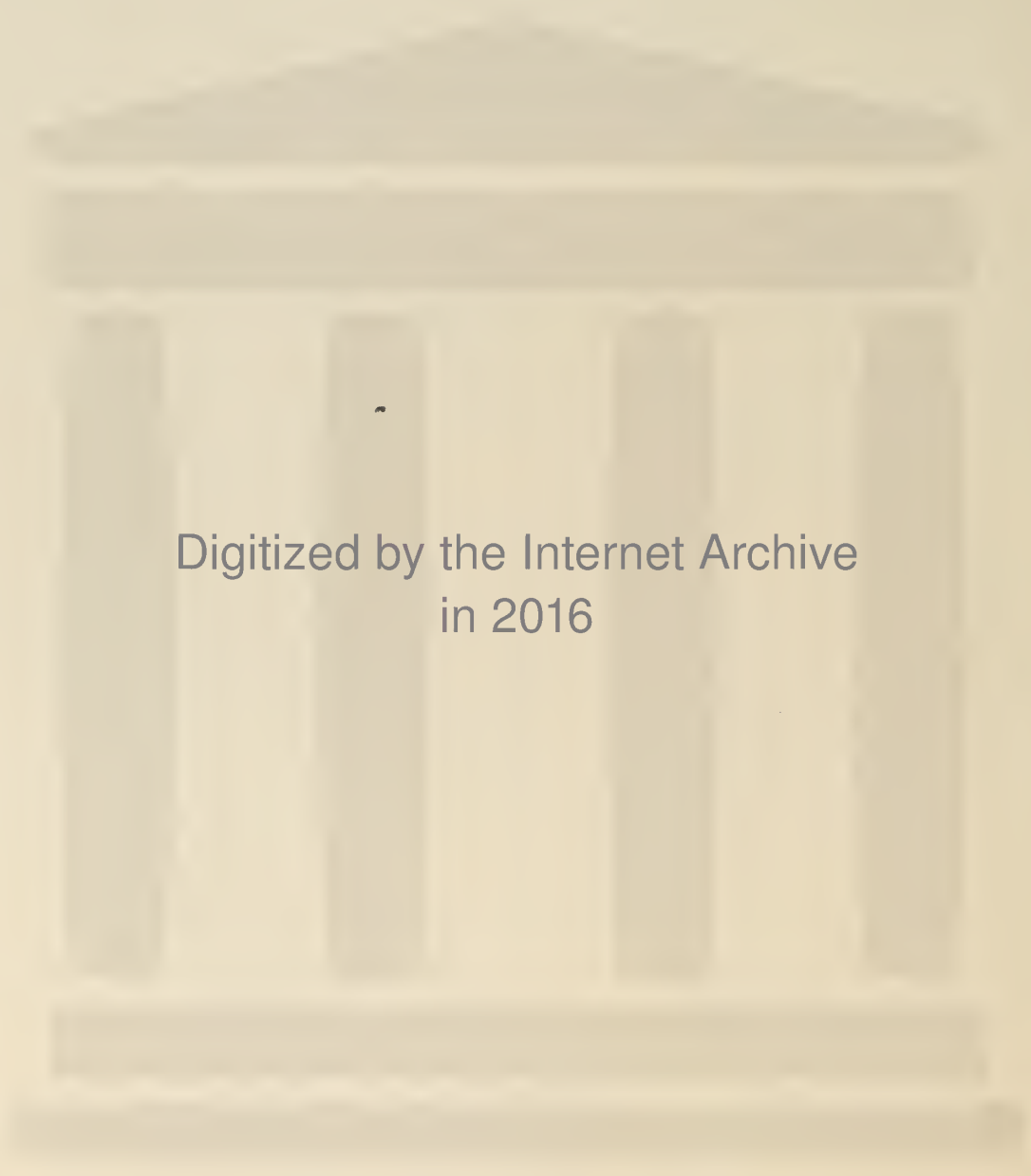
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# INSECT PEST SURVEY BULLETIN

Vol. 15 Supplement to Number 9 December 20, 1938

## DISTRIBUTION AND COLONIZATION OF EUROPEAN CORN BORER PARASITES IN 1938

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Incident to the colonization of parasites for the control of the European corn borer (*Pyrausta nubilalis* Hbn.), five species, viz: *Chelonus annulipes* Wesm., *Microbracon brevicornis* Wesm., *Macrocentrus gifuensis* Ashm., *Phaeogenes nigridens* Wesm., and *Inareolata punctoria* Roman, were available for distribution in 1938. All adults of *C. annulipes*, released were reared at the Toledo, Ohio, laboratory with *Ephestia kuehniella* Zell. as the host. *M. brevicornis* was reared on *P. nubilalis* at the Moorestown, N. J., laboratory. Stocks of *C. annulipes* and *M. brevicornis* for breeding purposes were supplied through the courtesy of the staff of the Dominion Parasite Laboratory located at Belleville, Ontario, Canada. *M. gifuensis* and *I. punctoria* adults were reared from *P. nubilalis* larvae collected in Massachusetts, and *P. nigridens* was imported from Italy.

A total of 144,872 parasite adults were shipped in 39 consignments and of this number 31 shipments were made for utilization on *P. nubilalis* in the infested areas in the United States and Canada. Eight shipments were made to supply parasites for testing on the sugarcane moth borer (*Diatraea saccharalis* F.) in Louisiana, Florida, and Puerto Rico. The shipments of each species and the mortality that occurred en route are shown in tables 1 to 5. In table 6 all parasite shipments made in 1938 are summarized by species.

Table 1.--Shipments of Chelonus annulipes during the 1938 season

Date	:C. annulipes:	Mortality	: Destination	:Shipping
	: shipped	:		: method
	: Number	:Number :Percent:		
Jan. 6 .....	1,800	: 1,331: 73.9	:Puerto Rico	: Air <sup>1/</sup>
March 8 ....	2,000	: 297: 14.8	: do.	: Do.
May 9 .....	2,000	: 19: 1.0	:Tasley, Va.	: Rail
17 .....	2,000	: 0: 0	:Philadelphia, Pa.	: Do.
24 .....	2,000	: 13: .7	: do.	: Do.
25 .....	2,000	: 4: .2	: do.	: Do.
26 .....	2,000	: 4: .2	: do.	: Do.
27 .....	3,000	: 29: 1.0	:New Haven, Conn.	: Do.
June 2 ....	7,000	: 194: 2.8	:Springfield, Mass.	: Do.
7 ....	6,000	: 14: .2	:New Orleans, La.	: Do.
8 ....	6,000	: 2,775: 46.2	:West Palm Beach, Fla.	: Air <sup>1/</sup>
9 ....	32,000	: 9,363: 29.2	:Puerto Rico	: Do.
13 ....	4,000	: 5: .2	:Springfield, Mass.	: Rail
14 ....	1,000	: 0: 0	:Adams, Ohio	: Automobile
16 ....	24,000	: 9,044: 37.7	:Puerto Rico	: Air <sup>1/</sup>
21 ....	2,000	: 42: 2.1	: do.	: Rail and boat
23 ....	3,000	: 12: .4	:Springfield, Mass.	: Rail
23 ....	4,000	: 2,264: 56.6	:Puerto Rico	: Air
25 ....	538	: 0: 0	:Adams, Ohio	: Automobile
Total ....	106,332	: 25,411: --		: --
Average .	--	: --: 23.9		: --

<sup>1/</sup> Shipment delayed en route and/or extended release period.

Table 2.--Shipments of Microbracon brevicornis during the 1938 season

Date	:M. brevicornis:	Mortality	: Destination	:Shipping
	: shipped:	:		: method
	: Number	:Number :Percent:		
March 24.....	2,350	: 164 : 7.0	:Tasley, Va.	: Rail
31.....	3,000	: 29 : 1.0	: do.	: Do.
April 12.....	1,860	: 244 : 13.1	: do.	: Do. <sup>1/</sup>
20.....	6,000	: 6 : .1	:Burlington, N. J.	: Automobile
25.....	5,863	: 0 : 0	:Atlantic, N. J.	: Do.
May 3.....	5,000	: 48 : 1.0	:New Haven, Conn.	: Rail
9.....	5,000	: 29 : .6	:Jamesport, N. Y.	: Automobile
Total.....	29,073	: 520 : --		: --
Average .	--	: --: 1.8		: --

<sup>1/</sup> Shipment delayed en route.



Table 3.—Shipments of Macrocentrus gifuensis during the 1938 season

Date	M. gifuensis: shipped	Mortality	Destination	Shipping method
	Number	Number:Percent		
March 26 .....	1,000	60 : 6.0	Belleville, Canada	Air-rail
29 .....	1,065	45 : 4.2	do.	Do.
April 5 .....	500	28 : 5.6	do.	Do.
August 6 .....	748	0 : 0	Burlington, N. J.	Automobile
13 .....	1,650	3 : .2	do.	Do.
17 .....	96	2 : 2.1	do.	Do.
Total .....	5,059	138 : --	--	--
Average .....	--	-- : 2.7	--	--

Table 4.—Shipments of Phaeogenes nigridens during the 1938 season

Date	P. nigridens: shipped	Mortality	Destination	Shipping method
	Number	Number:Percent		
April 25 .....	18	0 : 0	Burlington, N. J.	Automobile
August 30 .....	2,000	3 : 0.2	do.	Do.
31 .....	2,000	11 : .6	Atlantic, N. J.	Do.
Total .....	4,018	14 : --	--	--
Average .....	--	-- : 0.3	--	--

Table 5.—Shipments of Inareolata punctoria during the 1938 season

Date	I. punctoria: shipped	Mortality	Destination	Shipping method
	Number	Number:Percent		
April 5 .....	200	2 : 1.0	Belleville, Canada	Air-rail
August 13 .....	105	0 : 0	Burlington, N. J.	Automobile
17 .....	52	0 : 0	do.	Do.
19 .....	27	2 : 7.4	do.	Do.
Total .....	384	4 : --	--	--
Average .....	--	-- : 1.0	--	--

Table 6.--Summary of shipments of European corn-borer parasites during the 1938 season

Species	Parasites		Mortality	
	shipped			
	Number	Number	Percent	
<u>Chelonus annulipes</u> Wesm. . . . .	106,338	25,411	23.9	
<u>Microbracon brevicornis</u> Wesm. . . . .	29,073	520	1.8	
<u>Macrocentrus gifuensis</u> Ashm. . . . .	5,059	138	2.7	
<u>Phaenogenes nigridens</u> Wesm. . . . .	4,018	14	.3	
<u>Inareolata punctoria</u> Roman . . . . .	384	4	1.0	
Total . . . . .	144,872	26,087	--	
Average . . . . .	--	--	18.0	

Shipments were made in screen-sided metal cans wrapped in moist cloth strips and enclosed in corrugated paper cartons. Those consignments sent by air express had a thick outer wrapping of moistened cotton covered with cloth. Rail shipments were made in insulated shipping boxes as described in Entomological Technique Circular 77, with provision for re-icing en route, at the end of 15 hours, for all shipments requiring over 24 hours' shipping time. Rail transportation, as described above, proved far superior to air shipments in lower mortality of parasites, lower cost, convenience, and safety. High mortality of Chelonus annulipes occurred in shipments made by air express to Florida and Puerto Rico. The mortality incurred in air shipments of this parasite was 35.9 percent, partly due to delays en route, compared to a mortality of only 0.9 percent for shipments of this same species by other means. While the average mortality for all shipments was 18 percent, this was due almost exclusively to the high mortality in the air shipments of C. annulipes, mortality in shipments of all other species averaging only 1.8 percent. All shipments of C. annulipes were made from the Toledo laboratory and shipments of other parasites were made from the Moorestown, N. J., corn borer laboratory.

During the 1938 colonization season a total of 63,485 parasites of 5 species were released in 30 counties in 8 States. A list of all releases of European corn borer parasites made during 1938 is given in table 7 by States. Table 8 lists all releases of parasites made against the corn borer in the United States up to December 31, 1938.

A major objective of the 1938 parasite-colonization program was the distribution of the egg-larval parasite Chelonus annulipes over a greater portion of the area infested by the multiple-generation strain of the corn borer, as C. annulipes has become well established on this strain in southeastern Massachusetts and shows possibilities of becoming a valuable factor in retarding the abundance of its host. Twenty-seven releases of this parasite, including two liberations in Lucas County, Ohio, in districts where the borer has recently been observed to pass through two generations annually, were made in 1938. A total of 28,257 adults of C. annulipes were released. Map 1 shows the area colonized in 1938 and in previous years.

The releases of C. annulipes in the Eastern States were made a few days before the normal optimum date because conditions in April indicated an earlier host-egg-deposition period than usual. However, owing to unseasonably cool weather later, host oviposition was no earlier than normal. The releases of C. annulipes in Ohio were well synchronized with the presence of host eggs in the field.

Table 7.---Liberations of European corn borer parasites in the United States in 1938, by States

State and county	Township	Date of release	Parasite species released			
			:Chelonus :annulipes	:Microbracon :brevicornis	:Macrocentrus :gifuensis	:Inareolata:Total :Phaeogenes :nigridens :punctoria :
Connecticut:						
Fairfield	Fairfield	May 29	988	---	---	988
Hartford	E. Hartford	3	---	4,952	---	4,952
Middlesex	Haddam	29	994	---	---	994
New London	E. Lyme	29	989	---	---	989
Total	--	--	2,971	4,952	---	7,923
Maryland:						
Worcester	Newark	Apr. 13	---	1,616	---	1,616
Do.	do.	May 10	1,981	---	---	1,981
Total	--	--	1,981	1,616	---	3,597
Massachusetts:						
Essex	Haverhill	June 3	971	---	---	971
Franklin	Barnardston	do.	960	---	---	960
Hamden	Agawam	do.	976	---	---	976
Hampshire	Hadley	do.	966	---	---	966
Middlesex	Sudbury	June 4	982	---	---	982
Norfolk	Norfolk	do.	968	---	---	968
Worcester	Charleston	do.	983	---	---	983
Total	--	--	6,806	---	---	6,806
New Jersey:						
Atlantic	Egg Harbor	May 25	991	---	---	991
Bergen	Paramus	May 26	997	---	---	997
Burlington	Burlington	Apr. 20	---	5,994	---	5,994
Do.	do.	Apr. 25	---	---	18	18
Do.	do.	May 18	2,000	---	---	2,000
Do.	do.	Aug. 6	---	---	748	748
Do.	do.	Aug. 13	---	---	1,647	1,647
Do.	do.	Aug. 17	---	---	94	94
Do.	do.	Aug. 19	---	---	---	---
Do.	do.	Aug. 30	---	---	---	---
Total	--	--	1,997	---	---	1,997



Table 7.--Liberations of European corn borer parasites in the United States in 1938, by States (Continued)

State and county	Township	Date of release	Parasite species released					Total
			Chelonus	Microbracon	Macrocentrus	Phaeogenes	Inareolata	
New Jersey, cont'd.	Washington	May 28	996	---	---	---	---	996
Mercer	Monroe	do.	1,000	---	---	---	---	1,000
Middlesex	Atlantic	Apr. 25	---	5,863	---	---	---	5,863
Monmouth	do.	Aug. 31	---	---	---	1,989	---	1,989
Do.	do.	May 25	996	---	---	---	---	996
Ocean	Brick	---	6,980	11,857	2,489	4,004	182	25,512
Total	---	---	---	---	---	---	---	---
New York:	---	---	---	---	---	---	---	---
Suffolk	Riverhead	May 9	---	4,971	---	---	---	4,971
Do.	do.	26	999	---	---	---	---	999
Total	---	---	999	4,971	---	---	---	5,970
Ohio:	---	---	---	---	---	---	---	---
Lucas	Adams	June 14	1,000	---	---	---	---	1,000
Do.	do.	25	538	---	---	---	---	538
Total	---	---	1,538	---	---	---	---	1,538
Vermont:	---	---	---	---	---	---	---	---
Bemington	Arlington	June 14	998	---	---	---	---	998
Chittenden	Essex	25	996	---	---	---	---	996
Grand Isle	Grand Isle	25	995	---	---	---	---	995
Rutland	Poultney	14	1,000	---	---	---	---	1,000
Washington	Middlesex	25	997	---	---	---	---	997
Windham	Jamaica	14	999	---	---	---	---	999
Windsor	Bridgewater	15	997	---	---	---	---	997
Total	---	---	6,982	---	---	---	---	6,982
Virginia:	---	---	---	---	---	---	---	---
Accomac	Lee	March 24	---	2,186	---	---	---	2,186
Northampton	Franktown	31	---	2,971	---	---	---	2,971
Total	---	---	---	5,157	---	---	---	5,157
Grand total	---	---	28,257	28,553	2,489	4,004	182	63,485



Table 8.---Total releases of imported parasites in the United States to December 31, 1938

State	Apanteles sp. Oriental	Apanteles thompsoni Lyle European	Bracon atricornis (Smith) 1/	Campoplex multi-cinctus Grav.	Campoplex pyram-stae Smith	Chelonus annulipes Wesm.	Cremastus flavo-orbitalis (Cameron)	Eulimneria alkæa Ell. & Sach. 1/	Eulophus viridulus Thoms.	Exeristes robotator Fab.	Inareolata punctatoria Roman 2/	Lydella stabulans var. grisea R. D. 2/
Connecticut	---	21,268:	12:	---	1:	6,381:	1,483:	1,057:	17,200:	---	6,882:	42,723
Illinois	---	---	---	---	---	---	---	---	---	2,302:	---	---
Indiana	---	5,700:	---	---	---	2,259:	---	5,161:	6,671:	22,905:	6,588:	25,335
Maine	---	---	---	---	---	---	---	---	---	---	---	1,927
Maryland	---	---	---	---	---	1,981:	---	---	---	---	---	5,365
Massachusetts	388:	69,144:	127:	1,129:	1,697:	16,010:	6,762:	28,526:	84,786:	54,957:	30,938:	92,087
Michigan	---	34,837:	---	---	---	6,363:	---	24,075:	44,037:	86,607:	11,987:	121,219
New Hampshire	---	---	---	---	---	---	---	---	---	---	593:	5,569
New Jersey	---	---	---	---	---	7,430:	1,192:	---	---	---	1,925:	7,541
New York	3:	51,106:	---	61:	16:	5,782:	1,109:	9,279:	55,755:	40,050:	16,545:	122,153
Ohio	---	52,505:	---	357:	38:	20,705:	5,145:	36,398:	101,648:	87,826:	44,065:	217,448
Pennsylvania	---	5,774:	---	---	---	---	---	550:	---	20,119:	707:	11,588
Rhode Island	---	11,756:	211:	123:	47:	7,523:	1,014:	4,636:	7,446:	---	14,572:	35,293
Vermont	---	---	---	---	---	6,982:	---	---	---	---	2,279:	9,813
Virginia	---	---	---	---	---	10,777:	2,971:	---	---	---	1,678:	3,956
Total	391:	252,090:	350:	1,670:	1,799:	92,193:	19,676:	109,682:	317,543:	314,766:	138,759:	702,017

1/ European and Oriental material.

2/ European, Oriental, and domestic material.

Table 8.--Total releases of imported parasites in the United States to December 31, 1938 (Continued)

State	Macrocentrus gifuensis Ashm. <sup>1/</sup>	Meteorus nigricolis Thoms.	Microbracon brevi- cornis Wesm.	Microgaster tibialis <sup>1/</sup>	Nemorilla floralis Fall.	Phaeogenes nigridens Wesm. <sup>1/</sup>	Phorocera erecta Coq.	Zenillia mitis Meig.	Zenillia roseanae B. B.	Total
Connecticut	3,036		4,952	7,101	533	1,620	193	175	5,474	125,094
Illinois			3,635							5,937
Indiana	4,416		105,109	8,985				5	8,526	201,663
Maine			1,616							1,927
Maryland			1,084,590	34,689	371,21	885	344	514	64,755	1,714,820
Massachusetts	70,621	1	534,334	31,747		3,933		395	17,896	1,008,220
Michigan	40,790									6,162
New Hampshire										38,247
New Jersey	2,439		11,357	1,309		4,004				753,712
New York	37,657		354,265	34,752		569	4	463	29,743	753,712
Ohio	132,241		537,533	133,585	843	3,306	492	1,664	32,334	1,468,190
Pennsylvania	9,006		127,311	6,842		347		20	3,800	186,064
Rhode Island	33,214	8		19,740		12,037		183	9,305	157,113
Vermont										19,074
Virginia			5,157	3,199						27,733
Total	337,870	8	2,820,409	387,449	1,747,52	701,1	540,3	430,171	533,5	727,923

<sup>1/</sup> Includes adults from European and Oriental sources.

A second objective of the 1938 season was the testing of the larval parasite Microbracon brevicornis in the Eastern States with particular emphasis on the area south of New York City, where the winter storage of cornstalks in ricks is a general practice. These ricks support a large population of overwintering corn borer larvae and afford a source of borer infestation in the spring. Seven colonies, totaling 28,553 adults of Microbracon brevicornis, were released in 1938.

Eighteen adult females of Phaeogenes nigridens, held in cold storage over winter from material imported from Italy in the fall of 1937, were released in April 1938, when the first pupae of the season were available in the field. In addition, a large consignment of this parasite was received from Italy late in August 1938 and 3,986 adults, including both males and females, were released in New Jersey, bringing the total number liberated in 1938 to 4,004.

A total of 2,489 Macrocentrus gifuensis and 182 adults of Inareolata punctoria, available from domestic sources, were utilized to further the distribution of these parasites in previously uncolonized areas.







MAP 1

Colonization of  
Chelonus annulipes Wasm.

Releases in 1938

Releases prior to 1938

Releases in 1938 and  
previous years

Limit of known corn  
borer infestation



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